Guidance Overview

This Engineering Help Module was developed by the Federal Emergency Management Agency (FEMA) to support the Mitigation electronic grants (eGrants) system on-line application (https://portal.fema.gov/famsVu/dynamic/mitigation.html). The Engineering Help Module clarifies what is requested in the eGrants application, and provides information that would assist users in developing more complete grant applications. The help module is organized by sections, as they appear within the eGrants Application. Only those sections that were determined to have an engineering component have been included in this help module. Thus, the sections included in the Engineering Help Module are:

- Hazard Information (including Problem Description);
- Scope of Work (including Work Schedule);
- Cost Estimate; and
- Cost Effectiveness Information (including Damage History).

Guidance specific to each of the primary sections is provided, as is additional information that has been developed for specific sub-sections related to engineering support or documentation. Within the primary sections or sub-sections, additional guidance concerning specific mitigation project types (e.g., Acquisition, Elevation, Drainage, Wind Shutters) is provided whenever available. Additional mitigation project types, such as Seismic Retrofit or Wildfire Protection, may be added to the Engineering Help Module in the future.

eGrants SUBGRANT PROJECT APPLICATION

ENGINEERING REQUIREMENTS HELP

This help module provides general assistance to Applicants and Sub-applicants by describing the types of information and data needed for the Subgrant Project Application with respect to engineering feasibility. Each of the sections listed below are included in the Subgrant Project Application:

For each of these major sections, this help module provides clarification of the types of information that need to be submitted by Applicants and Sub-applicants to complete the Project Application. For many of the topics discussed in the help module, more specific guidance is also provided concerning specific mitigation project types (e.g., Acquisition, Elevation, Drainage, and Wind Shutters).

FEMA strongly encourages Applicants and Sub-applicants to use the electronic grant (e-Grants) system. Guidance for FEMA Mitigation Programs supported by e-Grants can be via the Internet at:

http://www.fema.gov/fima/pdm.shtm for the **Pre-Disaster Mitigation (PDM) Program**
http://www.fema.gov/fima/fma.shtm for the **Flood Mitigation Assistance (FMA) Program**

The eGrants log-in page can be accessed at:

https://portal.fema.gov/famsVu/dynamic/mitigation.html

Section 1. Hazard Information (including Problem Description)

If possible, data used to document existing conditions or the problem description must be obtained from recognized sources, such as Federal agencies (e.g., FEMA, U.S. Geological Survey [USGS], National Oceanic and Atmospheric Administration [NOAA]), state agencies, or academic institutions. When using locally derived data, include references and/or supporting documentation from credible sources (e.g., professional engineers or local government records).

1.1. Problem Description

Include a full and detailed description of the hazard(s) to be mitigated by the project. Make sure the description clearly describes the source of the hazard and how the hazard has caused previous damages and/or could produce future damages. Identify the geographic area covered (i.e., existing conditions of the site), the hazard history, and the FEMA Flood Insurance Rate Map (FIRM) information, if applicable.

Listed below are several common mitigation project types:

- **1.1.1. Acquisition/Elevation Projects**
- **1.1.2. Drainage Projects**
- **1.1.3. Wind Shutter Projects**

Additional guidance is provided concerning what information should be included to complete the Problem Description for each project type.

1.1.1. Acquisition/Elevation Projects

The following information should be included in the Problem Description:

- Describe in detail the source of flooding (e.g., riverine, coastal, local drainage) and provide any explanation of the cause(s) of flood damage (e.g., pre-FIRM construction, increased upstream development, inadequate drainage capacity of flooding source, etc.).
- List the history of previous flood events, including dates, extent and magnitude of impacts, photos of historic flooding, overall damage costs, and the estimated frequency of each specific event.
- Include the elevation of the lowest floor of the existing building being acquired or elevated. If it is an elevation project, provide the new elevation to which the building will be raised.
- If the facility is located in a FEMA Special Flood Hazard Area (SFHA) as shown on a FIRM, list the corresponding flood depths and discharges from the Flood Insurance Study (FIS) for the various storm recurrence intervals.

1.1.2. Drainage Projects

The following information should be included in the Problem Description:

- Describe the existing facility (where applicable, provide the lowest finished floor elevation), the existing watershed characteristics (i.e., flow conditions, drainage area, and system configuration), and general topography of the area.
- Describe in detail the source of flooding (e.g. riverine, coastal, local drainage) and provide any explanation of the cause(s) of flood damages (e.g. pre-FIRM construction, increased upstream development, inadequate drainage capacity of flooding source, etc.).
- List the history of previous flood events, including dates, extent and magnitude of impacts, photos of historic flooding, overall damage costs, and the estimated frequency of each specific event.
- If the facility is located in a FEMA SFHA as shown on a FIRM, list the corresponding flood depths and discharges from the FIS for the various storm recurrence intervals.

1.1.3. Wind Shutter Projects

The following information should be included in the Problem Description:

- Describe the use of any existing facility (e.g., public, residential, or commercial).
- Provide information on the type of building (e.g., structure-type, exterior walls, roof deck, roof covering, etc.)
- Describe the source of high winds (e.g., hurricanes, tropical storms, etc.) and provide any known explanation of the cause of the hazard (e.g., large windows or other openings, inadequate or no shutter protection, etc.)
- List the history of any previous wind damage events, including dates, extent and magnitude of impacts, photos of historic wind events, overall damage costs, and the estimated frequency of damaging wind events.
- Provide information on the wind design of the current building, building code at the time of construction, high wind design requirements for the location (if applicable), and what proposed standards will be met or exceeded.
- Provide the location of the facility, including distance from the coast, and indicate if the facility is located in an SFHA.

Section 2. Scope of Work (including Work Schedule)

The Scope of Work describes the objectives, methods, feasibility, outcomes, timeline, milestones, resources, deliverables, and benefits of, as well as reasons for, the proposed project. The proposed mitigation activity should identify the hazards to be addressed, with a clear, detailed written description of the method used to select the proposed activity, as well as the project's dimensions, size, and area.

For further information on the general requirements for Scopes of Work, refer to:

http://www.fema.gov/fima/pdm.shtm for the **Pre-Disaster Mitigation (PDM) Program**
http://www.fema.gov/fima/fma.shtm for the **Flood Mitigation Assistance (FMA) Program**

The sub-sections listed below contain additional information in support of the eGrants Application.

- **2.1. Describe the need for this activity**

Under the "WORK SCHEDULE" topic:

- **2.2. Enter Work Schedule**

2.1. Describe the need for this activity

Technical documentation should be provided that demonstrates the level of protection of the proposed project in mitigating against future hazard-related damages. In addition, the anticipated level of project effectiveness should be stated clearly. Detailed technical back-up information should be included with the Scope of Work, including but not limited to:

- Detailed description of the project that is being proposed and how it conforms to accepted engineering practices;
- Any studies, schematics, or construction plans that detail the proposed project;
- Existing site information, such as ground or first floor elevations, existing building and foundation type (if a building project), and past damage descriptions;
- A site map clearly showing the locations of all proposed project components;
- Any calculations or models that support the proposed mitigation activity by clearly demonstrating a decrease in future damages;
- A description of strengths, weaknesses, opportunities, and constraints affecting the proposed project;
- Applicable state, local, or Federal design codes or standards that must be followed (e.g., Base Flood Elevation [BFE], Design Flood Elevation [DFE], flood depth, design wind speed, or specific jurisdictional ordinances and regulations).

Additional information is provided for the following common mitigation project types:

- **2.1.1. Acquisition**
- **2.1.2. Elevation**
- **2.1.3. Drainage Projects**
- **2.1.4. Wind Shutter Projects**

2.1.1. Acquisition Projects

The following information should be included in the Scope of Work description:

- List the number of each type of structure or property that is to be acquired. Include maps that clearly indicate the location of the facilities to be acquired.
- Describe how these structures have been selected, the level of the property owner commitment to this project, and the proposed approach for the acquisition process.
- Provide evidence of an alternative analysis (e.g., using elevations and flood depths from the applicable FIRM and FIS, show that elevation projects are not an appropriate solution).
- State if there are any state or local codes or standards that need to be followed, including any that pertain to removal of hazardous materials.
- Provide documentation certifying that the property will remain as open space in perpetuity.

2.1.2. Elevation Projects

Technical documentation should be provided that demonstrates that the proposed project, if completed as designed, will successfully protect the structure(s) against future flood damages up to the DFE. Detailed technical information provided in the Scope of Work description should include the following:

- Describe the elevation technique being employed for each structure to be elevated. Identify the existing building type, exterior wall covering (e.g., brick versus siding), and number of stories.
- If possible, include calculations for all applicable loads (live, dead, lateral, soil, wind, flood, and scour), particularly for structures located in V Zones on the FIRM.
- Describe the existing and new foundation type. Show pile or pier configuration, loads, and connection details.
- State the elevation of the existing first floor and the elevation to which the first floor of the structure will be raised, its relation to the BFE and/or storm surge elevations, and the elevation of the adjacent grade.
- Show that all applicable NFIP floodplain management requirements have been addressed.
- Include any Federal, state, or local building codes or standards that need to be followed (e.g., FEMA 347, Above the Flood: Elevating your Floodprone House).

2.1.3. Drainage Projects

The scope of drainage projects can vary greatly. As a result, the proposed mitigation activity should be well defined, with a clear, detailed written description of the entire Scope of Work. Technical documentation should be provided that demonstrates that the proposed project successfully reduces future flood levels and associated future flood damages. In addition, the anticipated level of project effectiveness should be stated as clearly as possible. Detailed

information provided in the Scope of Work description should include (but is not limited to) the following:

- Describe in detail the project that is being proposed and clearly state the design event that is being mitigated against (e.g., 10-, 50-, 100-, or 500-year flood).
- Include any studies, schematics, or construction plans that will help give details of the proposed project.
- Include a site map clearly showing the location of all proposed project components and their location relative to the areas of historic damage within the contributing watershed.
- Include any hydrologic and/or hydraulic calculations or models that support the proposed mitigation by clearly demonstrating the decrease in future flood levels and associated future flood damage.
- Show that all NFIP floodplain management requirements have been addressed. Any encroachment in the floodway must include a hydraulic analysis to show that there will be no increase in BFEs.
- Describe and quantify any potential downstream and upstream effects from the proposed project.
- Include any state or local stormwater design codes or standards that need to be followed, including design flows, rainfall frequencies, freeboard, water surface, changes in water surface elevation, allowable velocities, etc.

2.1.4. Wind Shutter Projects

Technical documentation should be provided in the Scope of Work that demonstrates that the proposed project will successfully protect the structure(s) against future high wind damages. Detailed technical information should be provided in the Scope of Work description, including the following:

- Describe the shuttering technique to be applied to each structure being protected. Also, specify if the entire building or only parts of the building, such as shelter areas, will be receiving shutters and if any other wind mitigation is being performed (e.g., improvements to the load path).
- Describe the structure of the building (e.g., concrete frame, wood frame, steel frame masonry [reinforced or unreinforced], etc.). Identify the wall structure, if different from above. Identify roof structure, roof deck and roof covering.
- State what maximum wind speed or storm class the structure will be designed to withstand and what code or standard was used to calculate the wind speed.
- Include wind design properties (e.g., Exposure Category, Enclosed or Partially Enclosed building, Importance Factor) and calculations for applicable wind loads.
- State what maximum wind speed and debris impact criteria the shutters will be designed to withstand, including any applicable standards (e.g., SSTD 12, ASTM E 1996). Include missile speed and weight.
- Include any Federal, state or local building codes or standards that need to be followed (e.g., FEMA 361, Design and Construction Guidance for Community Shelters).

2.2. Enter Work Schedule

Provide the anticipated work schedule for the project, including all tasks and significant milestones throughout the entire performance period. Performance periods may be limited for certain mitigation grant programs, thus it is necessary to be aware of time constraints when developing the proposed work schedule.

- **Description of Task:** Include a very brief description of each separate task included in the Scope of Work.
- **Starting Point:** Estimate the starting time of the specific task.
- **Duration:** Estimate the time needed to complete the task.
- **Estimate the total duration of the proposed activity:** Estimate the total duration for all tasks to be completed.

Additional information concerning work schedules is provided for the following common mitigation project types:

- **2.2.1. Acquisition**
- **2.2.2. Elevation**
- **2.2.3. Drainage Projects**
- **2.2.4. Wind Shutter Projects**

2.2.1. Acquisition Projects

The following project elements should be included in the Work Schedule:

- Appraisal
- Property survey
- Purchase offer, closing
- Tenant relocation
- Hazardous material survey (e.g., asbestos, underground storage tanks, etc.)
- Permitting, contracting and demolition plan
- Site preparation
- Demolition and hauling
- Site grading and landscaping

2.2.2. Elevation Projects

The following project elements should be included in the Work Schedule:

- Appraisal
- Property survey
- Tenant relocation
- Bid proposal and award
- Permitting, and contracting
- Site preparation
- Construction of project (Elevation)
- Site grading and landscaping

2.2.3. Drainage Projects

The following project elements should be included in the Work Schedule:

- Design and specifications
- Obtain property/easements
- Permitting
- Bid proposal and award
- Construction of project
- Site grading and landscaping

2.2.4. Wind Shutter Projects

The following project elements should be included in the Work Schedule:

- Design and specifications
- Bid proposal and award
- Permitting and contracting
- Site inspection/preparation
- Construction of project

Section 3. Cost Estimate

The Cost Estimate describes all anticipated and potential costs associated with the proposed activity, and represents the Sub-applicant's best estimate of the total value of the proposed activity. The Cost Estimate should reflect the activities described in the Scope of Work and be prepared with adequate documentation. The Cost Estimate should include the following:

- Detailed information for all project costs, including materials, labor equipment, and subcontract costs, in addition to maintenance costs over the useful life of the project. The use of "lump sum" items should be avoided whenever possible. The Sub-applicant should quantify or provide additional breakdown of lump sum costs items.
- The source of the estimate (e.g., documented local cost, previous similar projects, bids from qualified professionals, published national or local cost estimating guides, etc.), and documentation supporting each source. When using costs from other related projects, provide information from the referenced project so that the cost estimate may be compared and determined to be applicable to the currently proposed project.
- Other related construction, demolition, relocation, maintenance, environmental and/or historic preservation costs, such as survey, permitting, site preparation, and material disposal.
- Reference the base year of all cost estimates provided.
- Make sure costs include the anticipated date of construction.
- Consider potential impacts to estimated costs resulting from any deviations from the anticipated date of construction.

Additional information concerning cost estimating is provided for the following common mitigation project types:

- **3.1. Acquisition**
- **3.2. Elevation**
- **3.3. Drainage Projects**
- **3.4. Wind Shutter Projects**

For further information on the general requirements for Cost Estimates, refer to:

http://www.fema.gov/fima/pdm.shtm for the **Pre-Disaster Mitigation (PDM) Program**
http://www.fema.gov/fima/fma.shtm for the **Flood Mitigation Assistance (FMA) Program**

3.1. Acquisition Projects

Costs should be included for, at a minimum, the following tasks:

- Site assessment
- Surveys
- Permitting
- Appraisals
- Title search
- Easement and deed recordation
- Legal fees associated with property transfer
- Property acquisition

- Relocation costs for renters (if applicable)
- Closing costs
- Hazardous material inspection
- Structural demolition or relocation
- Management and administration

Documentation should be provided as to the method for determining the Fair Market Value of the structure(s) included in the Scope of Work.

3.2. Elevation Projects

Costs should be included for, at a minimum, the following tasks:

- Typical project elements, such engineering designs and landscaping
- Elevation construction itself, including any demolition and foundation work that may be required
- Relocating and/or reconnecting utilities
- Future maintenance, such as inspection, re-pointing, or repainting of elevating structure

3.3. Drainage Projects

Costs should be included for, at a minimum, the following tasks:

- Typical project elements, such engineering designs
- Obtaining required permits.
- Itemized construction costs
- Future maintenance, such as clearing/cleaning culverts, mowing berms or embankments, and maintaining erosion protection areas

3.4. Wind Shutter Projects

Costs should be included for, at a minimum, the following tasks:

- Strengthening the building around the windows where the shutters are to be installed
- Itemized material and installation costs
- Maintenance and periodic testing of shutters to maintain an operable condition

Section 4. Cost Effectiveness Information (including Damage History)

Project applications should include complete Benefit-Cost Analysis (BCA) documentation, including damage history, methodology used to determine hazard event frequency, and all BCAs to support the project's Benefit-Cost Ratio.

Additional information on what is being requested in the eGrants Application is provided for the topics listed below:

- **4.1. What is the source and type of the problem?**
- **4.2. How frequent is the event?**
- **4.3. How severe is the damage?**
- **4.4. What kinds of properties are at risk?**
- **4.5. Are there better, alternative ways to solve the problem?**
- **4.6. Are the mitigation project costs well documented and reasonable**?

Under the "DAMAGE HISTORY" topic:

- **4.7. Description of Damage**

4.1. What is the source and type of the problem?

Give a brief description of the problem. Describe the hazard(s) to be mitigated by the project, identify the geographic area covered, and the hazards to be addressed.

4.2. How frequent is the event?

If applicable, list the frequency and magnitude of the hazard event. List historical data, with supporting documentation.

4.3. How severe is the damage?

Describe the damage that has occurred in the past, along with costs associated with the damage.

4.4. What kinds of properties are at risk?

Describe the type of property (residential, public service, etc.) that is at risk.

4.5. Are there better, alternative ways to solve the problem?

Describe all alternatives that have been considered for the mitigation project. The description should include a cost estimate and why each alternative approach was not chosen.

4.6. Are the mitigation project costs well documented and reasonable?

Documentation should be provided that provides sufficient detail and references, where applicable, to demonstrate that the project costs are reasonable for the mitigation activity proposed. Whenever possible, data that are being used to document project costs must be obtained from a recognized and credible source, such as Federal agencies (e.g., USGS or U.S. Army Corps of Engineers), state agencies, national cost estimating data, or professional engineers.

4.7. Description of Damage

Provide a brief, quantitative description of documented historical damages. List the number of properties and/or structures damaged.